lism in the two sexes. If its cause is a substance in the blood it may be "inherited" from the female alone, and the male which manifests the disease can not transmit it. Thus it would be a case of transmission through somatic elements rather than through the germ cells.

F. T. L.

INVERTEBRATE MORPHOLOGY

Form Variation in Amblystoma tigrinum.—Powers[1] has observed the aquatic forms of this salamander both in their natural environment and under artificial conditions. His paper contains a large amount of material of great interest which would be much clearer reading if the numerous observations and experiments had been more explicitly described as to objective point and methods employed. The paper is too long for condensation here, but a few of the results can be noticed and will be welcome to those interested in the axolotl question. He distinguishes two main types, the ordinary larvæ and the cannibals, both by habits and in important points of structure. Taking the ordinary form first, two types as a body form are recognizable: those with the habit of crawling about on the bottom in a sluggish manner and thus living largely in the dark, these are of a broader shorter form and are called the "robust type," and a second type of quite different habit, being active swimmers going about actively in search of their prey, and of an elongate slender form, the "slender type." There is a great difference in the ratio of head width to total length in these two types, head width being contained 6.42 in total length in the robust type and 11 times in the slender ones. The mode of feeding is quite different in these two types. In the robust bottom-living forms food is obtained by using the mouth as a sieve and opening it widely to strain water through it in hopes of finding food thereby, with the result that the gape is increased. On the other hand, the slender swimming forms go about actively in search of prey, which, when they see it, they actively seize so that the mouth is not opened so widely as in the sieving process of the sluggish robust type. He also notes variations in special parts, such as the tail, the head and the posterior limb. Tails vary

[1] Powers, J. H., '07. Morphological Variations and its causes in *Amblystoma tigrinum*. Studies from the Zoological Laboratory of the University of Nebraska, 71, pp. 1–77, pls. i–ix.

from broad to narrow, long to short, some are flat and some more rounded and tapering, thick and fleshy or thin. Heads vary in breadth, length, thickness, contour of muzzle, distance between nares, between eyes, size of gape of mouth. Hind limbs vary as to robustness or slenderness, rounded or flattened shape of toes and habitual position of limb with reference to body. The writer of the paper is inclined to refer most of the variations which he finds directly or indirectly to the nutrition of the possessor. He says "excessive nutrition with these larvæ seems as it were to overflow into all the peripheral parts quite regardless of function." He shows very satisfactorily that the foot features which seem like aquatic life adaptations are not such in fact, but are due to over-nutrition. In swimming these forms do not use the foot; it lies idly alongside the body.

The cannibal form of larvæ is very interesting and wholly novel. There are occasional larvæ which for reasons as yet unknown, and against the tendencies of most of the larvæ, have adopted the habit of feeding on their fellows. It was possible to convert some non-cannibal larvæ to the habit, while not even starvation would induce others to adopt it. Cannibals, a number of photographs of which are shown, are characterized by the great over-development of the head and under-development of the body and tail. The changes came on rapidly after the habit had become established, a week showing very marked steps in that direction. The head enlargement includes internal as well as external anatomical changes, gill arches become more elongated, more numerous and much larger teeth develop in the palatine region; the entire head becomes more elongated, the brain more posterior in position, and, more strange still, it "is easily seen through the soft palate . . . and is of a less compact and more piscine type." All these points need fuller and more detailed description and illustration than is given in the paper, and will doubtless receive further attention in a later work.

The paper is a valuable contribution to knowledge of the variations of Amblystoma; it does not add to the interesting problem of the cause of the non-transformation of the aquatic forms. We do not find ourselves in accord with the author's proposition to consider this a dimorphic species having a terrestrial and an aquatic form, for this seems to put the aquatic form on a par with the terrestrial one. The aquatic form seems too

occasional in occurrence and locality to justify this. We do not know but that all aquatic cases would have metamorphosed under suitable conditions, and the terrestrial form is indicated as being definitive by the anatomy of the circulatory and respiratory apparatus. Also we do not share Powers's objection to the name axolotl and siredon as a designation for the aquatic form; both have the sanction of general usage and do not apply to other animals, so that they are entirely clear.

H. L. O.

EXPERIMENTAL ZOOLOGY

Some Experiments on the Development and Regeneration of the Eye and the Nasal Organ in Frog Embryos.[1]—Dr. E. T. Bell has conducted a series of experiments on embryos of *Rana esculenta* and *R. fusca,* in which he found certain new facts in the development of the eye and nasal organ. Wolff had shown in 1894 that the crystalline lens of the salamander may be regenerated from the upper margin of the iris. Fischel also found later that the lens in the newt's eye would regenerate from the iris, and by wounding the iris in several places after removal of the original lens that one or more lenses were formed. Spemann, Lewis and others show in amphibian embryos that there is no localization of lens-forming material in any given area of the ectoderm, and that the formation of a crystalline lens depends directly upon the stimulation of the ectoderm, or outer embryonic wall, through contact with the optic-cup. Lewis in a series of interesting experiments in which he tranferred the optic-cup from its original connection with the brain to a more caudal position showed that when it came in contact with the ectoderm in this new region the optic-cup stimulated lens formation. In another instance the skin from the ventral surface of *Rana sylvatica* was placed over the optic-cup of *R. palustris* and gave origin to a lens.

Bell has discovered several other possible sources of origin for the crystalline lens. He cut off the optic-vesicle of the embryo and turned it completely around so that the former outer side now turned toward the brain; under these conditions the pigment layer of the retina itself was induced to form a lens-like structure. When the brain was opened in the mid-

[1] *Archiv für Entwicklungsmechanik der Organismen,* XXIII, pp. 457–478, pl. 14 to 20.